

particularly by reducing reliance on market shares and concentration measures alone. For example, in describing enforcement policy for mergers raising concentration by more than 100 points in moderately concentrated markets (post-merger HHI between 1000 and 1800), the 1984 Guidelines had stated that the Antitrust Division "is likely to challenge mergers in this region" unless the Department concluded on the basis of other factors that the merger was not likely substantially to lessen competition. In the 1992 Guidelines, the language concerning the likelihood of legal challenge was deleted, and the concern moderated to state that such transactions "raise significant competitive concerns" depending on other factors set forth in the Guidelines.

Similarly, when evaluating highly concentrated markets (post-merger HHI above 1800), the 1984 Guidelines stated that mergers that increased the HHI by more than 100 points were likely to be challenged because, "only in extraordinary cases will such [other] factors establish that the merger is not likely substantially to lessen competition." By 1992, the standard had been modified to reflect the belief that if a post-merger HHI exceeded 1800 and the change was greater than 100, there was a presumption that the transaction was "... likely to create or enhance market power or facilitate its exercise." Even in this case, however, the Guidelines stated that this presumption could be overcome by a showing that other factors made the exercise of market power unlikely.

The changes in language between 1984 and 1992 reflected the actual enforcement standards being applied. Few cases were brought during the 1980s that attempted to prevent or enjoin mergers in markets with post-merger HHI's below 1800, regardless of the change in the

its Guidelines in 1984. The joint 1992 Guidelines thus reflect a revision of the 1982 and 1984 documents.

HHI. In fact, an analysis of the cases actually filed by the FTC and Antitrust Division found that complaints were seldom brought in markets where the post-merger HHI was in a range of 2000 to 2100. For example, in 1989 an American Bar Association Task Force wrote:

The question remains, however, whether the 1984 Merger Guidelines accurately present the [Antitrust] Division's enforcement policy as applied to actual cases. ... The Division has brought very few cases in which the HHI levels for the post-merger industry were between 1000 and 1800, although the 1984 Guidelines indicate that in this range the Department "is likely to challenge" a merger that increases the HHI by 100 points or more, absent countervailing factors. Similarly, it appears that a significant number of mergers with HHIs in excess of 1800 and HHI increases above 100 have not been challenged, despite the 1984 Guidelines' assertion that such mergers lack anticompetitive effects "only in extraordinary cases." The resulting public perception is that the Division may be pursuing an enforcement policy more lenient than the 1984 Guidelines dictate...⁴²

Similarly, in commenting on the 1984 Guidelines, the then-Acting Assistant Attorney General for Antitrust, Charles James, stated:

... the concentration standards [in the 1984 Guidelines] did not reflect enforcement practice. In fact, the agencies challenged only very few mergers in moderately concentrated markets and only some of the mergers in markets that were highly concentrated.⁴³

The failure of the antitrust agencies strictly to enforce the 1984 Guidelines, in which the standards were based heavily on concentration screens, reflected two practical considerations. First, in reviewing mergers for enforcement action, the agencies routinely considered, and gave substantial weight to, factors other than concentration and market shares. Thus, a wide variety of factors, several of which were subsequently incorporated into the 1992 Guidelines, played major roles in the screening process, and influenced the agencies in their exercise of discretion in case selection.

⁴²"Report of the ABA Antitrust Law Section Task Force on the Antitrust Division of the U.S. Department of Justice," *Antitrust Law Journal*, Vol. 58, Issue 3, p. 760 (footnotes omitted).

⁴³Charles A. James, "Overview of the 1992 Horizontal Merger Guidelines," *Antitrust Law Journal*, Vol. 61, Issue 2, p. 449. See also Janet L. McDavid, "The 1992 Horizontal Merger Guidelines: A Practitioner's View of Key Issues in Defending a Merger," *Antitrust Law Journal*, Vol. 61, Issue 2, fn. 9, p. 461.

Second, in the 1980s, in ruling on merger actions brought by the antitrust authorities, the courts gave substantial weight to factors other than concentration. Indeed, a significant number of cases brought by the government were rejected, with the courts pointing to factors in addition to market shares and concentration. For example, in one important Circuit Court decision (*United States v. Baker Hughes Inc.*), the Court wrote:

Imposing a heavy burden of production on a defendant would be particularly anomalous where, as here, it is easy to establish a prima facie case. The government, after all, can carry its initial burden of production simply by presenting market concentration statistics. To allow the government virtually to rest its case at that point, leaving the defendant to prove the core of the dispute, would grossly inflate the role of statistics in actions brought under Section 7 [of the Clayton Act]. The Herfindahl-Hirschman Index cannot guarantee litigation victories....Requiring a "clear showing" in this setting would move far toward forcing the defendant to rebut a probability with a certainty.⁴⁴

Similarly, in *United States v. Syufy Enters.*, despite a merger to monopoly for a short period in the distribution of first-run movies in Las Vegas, the Court wrote:

Time after time, we have recognized this basic fact of economic life: A high market share, though it may raise an inference of monopoly power, will not do so in a market with low entry barriers or other evidence of a defendant's inability to control prices or exclude competitors.⁴⁵

As this discussion reflects, in antitrust enforcement matters involving changes in market structure, the antitrust authorities, in exercising prosecutorial discretion, and the courts, in actually enforcing the law, have both relaxed the concentration and share standards that may

⁴⁴*United States v. Baker Hughes Inc.*, 908 F.2d 992 (D.C. Cir. 1990). In the *Baker* case, in the market for hardrock hydraulic underground drilling rigs, the HHI increased by 1425 points, from 2872 to 4303. The Court pointed to such factors as easy entry by foreign firms and the sophistication of buyers as conditions mitigating concern based on HHI numbers.

⁴⁵*United States v. Syufy Enters.*, 903 F.2d 659 (9th Cir. 1990). In *Syufy*, the Court cited with approval *Hunt-Wesson Foods, Inc. v. Ragu Foods, Inc.*, 627 F.2d 919, 924 (9th Cir. 1980), cert. denied, 450 U.S. 921, 101 S.Ct. 1369, 67 L.Ed. 348 (1981): "Blind reliance upon market share, divorced from commercial reality, [can] give a misleading picture of a firm's actual ability to control prices or exclude competition." Similarly, in *United States v. Country Lakes Foods, Inc.*, 734 F. Supp. 669 (D. Minn. 1990), the Court rejected the Department of Justice case seeking to enjoin a merger between fluid milk producers in Minneapolis, despite the fact that the HHI rose from 2186 to 2832. The Court pointed to the ease of entry and expansion, the presence of powerful buyers, and efficiencies that would be created by the transaction.

have been applied in the past, and moved away from very heavy reliance on market share and concentration measures. Instead, they have applied what is appropriately viewed as a "rule of reason" analysis that incorporates many factors other than market share that are important to the competitive process in specific industries. Such a rule of reason approach is particularly appropriate for markets such as those for mobile telecommunications services, where the facts and circumstances vary by region.

V. Structural Analysis of the Mobile Telecommunications Market

Capacity and Market Shares

Because the available evidence suggests that firms may move with relative ease from the provision of one mobile telecommunications service to another, capacity is an appropriate measure of a firm's share.⁴⁴ Where firms may offer an array of services with existing equipment and infrastructure, current sales are not a good measure of competitive presence. Rather, the significance of each firm is better gauged by its ability rapidly to provide the various services in the event that prices and profits change to make specific activities more (or less) profitable. If a firm's capacity were simply identified by the bandwidth authorized to provide mobile telecommunications services, and a cellular operator's entire capacity was shifted to digital technology, each cellular operator's capacity share would simply be its share of industry

⁴⁴Marguer Guidelines, § 1.41. More precisely, a mobile telecommunications firm's share within a market depends on its capacity and the proportion of the population it serves with the market. In the succeeding analysis [Tables 1 to 12], we simplify the analysis by assuming that firms with assigned bandwidth serve the entire market. In practice, where some firms will serve only a portion of the population within a market (e.g., some firms will serve customers in a BTA within a broader market), those firms that do not operate throughout the entire market would have a smaller share than in this analysis. As such, the concentration analysis in Tables 3 to 12 provides "worst case" computations of shares and HHIs. We return to this point at the end of this section, where we discuss how a firm's share in a market for mobile telecommunications services should be computed when the service territories for competitors are not all the same and marketwide.

bandwidth. Since each cellular operator holds 25 MHz of the total 170 MHz bandwidth available to offer mobile telecommunications services, its share would be 14.7 percent $[25 \text{ MHz} \div 170 \text{ MHz} = .147]$.⁴⁷

For mobile services, however, a carrier's effective capacity is not necessarily measured solely by the amount of bandwidth assigned to it. What is important is how that bandwidth, an input, can be converted into usable output, the information that it can carry. Under FCC rules, incumbent cellular providers will, for some time, have an obligation to serve customers who wish to continue to use analog equipment, or who use digital equipment that is incompatible with that of the cellular operator in whose area they are calling.⁴⁸ Because of this obligation to continue to serve customers that have purchased analog equipment, the effective capacity per unit of bandwidth will be smaller for existing cellular operators than for those new PCS carriers not similarly encumbered. Although there is some uncertainty about the precise magnitude, studies estimate that the capacity of a given amount of bandwidth is increased substantially if digital rather than analog technology is used to provide a service.⁴⁹ This means that the share of industry capacity available to incumbent cellular operators will be smaller than their bandwidth share. The greater the percentage of bandwidth that must be reserved for lower-capacity cellular operations, i.e., the smaller the percentage converted to digital, the smaller is the market share

⁴⁷The 170 MHz of bandwidth is the 120 MHz that will be auctioned for PCS, and the 50 MHz employed by existing cellular carriers. Additional capacity (e.g., from SMR licenses) will be available to offer mobile services. We address the significance of this additional capacity below.

⁴⁸Second Report and Order, ¶ 111.

⁴⁹D.P. Reed ("Putting It All Together: The Cost Structure of Personal Communications Services," Federal Communications Commission, Office of Plans and Policy, November 1992, pp. 66-69) provides references for many of these estimates.

of the cellular carrier. Incumbent cellular operators will face an analog "handicap" so long as they must continue to provide analog cellular services.

Table 1 presents the share of industry capacity of a cellular operator that holds a license for the use of 25 MHz of spectrum after the FCC auctions the rights to use an additional 120 MHz of bandwidth, increasing the total bandwidth available for mobile telecommunications services to at least 170 MHz. Capacity estimates are derived under various assumptions about (a) the percentage of the existing cellular assignment that has been converted to digital, and (b) the increase in capacity resulting from a shift from analog to digital systems.⁵⁰ For example, assume that each of the two incumbent cellular operators must hold 10 MHz of their existing assignment of 25 MHz to serve customers with analog equipment, and that digital technology increases capacity by a multiple of 6 over analog. Under these circumstances, a cellular operator could turn 15 MHz of bandwidth to digital services, and it would continue to operate 10 MHz with analog technology. While the operator would have a 14.7 percent bandwidth share, it would have a share of only 10.9 percent of industry capacity to provide mobile services.

⁵⁰This increase will depend in part on the digital technology employed. Estimates of the increase in capacity from the introduction of digital technology, for which calculations are presented in the table, range from a multiple of 2 to 18, depending on such factors as the radio access method, Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), or Code Division Multiple Access (CDMA), that is adopted. The base case analyzed by Reed, which assumes a kind of generic digital service, employs an estimate of "almost a three-fold increase in capacity relative to the current cellular standard," which is consistent with the lower end of this range. The upper end of this range reflects the application of conversion factors of 10:1 and 18:1 and assumed adoption of Code Division Multiple Access (CDMA). See "US WEST NewVector and QUALCOMM announce plans to form CDMA subscriber equipment relationship," Business Wire, May 11, 1993. A large increase in capacity will result even if Time Division Multiple Access (TDMA) is employed. On TDMA see "Ericsson takes the lead in TDMA digital cellular system installations," Business Wire, September 30, 1993.

Table 1

**Share of Industry Capacity of a Cellular Operator with a
25 MHz Assignment**

MHz Analog	MHz Digital	Digital/Analog Efficiency Factor					
		2	3	4	6	10	18
20	5	0.100	0.081	0.071	0.061	0.052	0.046
15	10	0.113	0.100	0.093	0.086	0.080	0.076
10	15	0.125	0.117	0.113	0.109	0.105	0.103
5	20	0.136	0.133	0.131	0.129	0.127	0.126

Source: Charles River Associates.

Table 2 presents similar computations for a cellular operator that adds 10 MHz of bandwidth to its existing holding of 25 MHz in the forthcoming PCS auction. In this table, the capacity share represented by the added 10 MHz is simply added to the share of capacity in Table 1. Comparison of cells in the two tables shows the increase in the capacity share from the added 10 MHz that occurs under the various sets of assumptions. For example, if 40 percent (10 MHz) of the original 25 MHz must be retained for analog services, and the efficiency advantage of digital over analog is a factor of 6, adding 10 MHz of digital capacity to the cellular operator increases its share from 10.9 percent to 17.4 percent. Had the cellular carrier been able to turn all of its 35 MHz of bandwidth to digital applications, its effective share would have increased to 20.6 percent.

Table 2

**Share of Industry Capacity of a Cellular Operator with a
35 MHz Assignment**

MHz Analog	MHz Digital	Digital/Analog Efficiency Factor					
		2	3	4	6	10	18
20	15	0.167	0.151	0.143	0.134	0.127	0.122
15	20	0.177	0.167	0.161	0.155	0.150	0.147
10	25	0.188	0.181	0.177	0.174	0.171	0.169
5	30	0.197	0.194	0.192	0.191	0.189	0.189

Source: Charles River Associates.

We expect that cellular operators will, over time, convert their analog systems, shifting gradually to an all- or primarily-digital system. But this transition will take some time, during which the analog "handicap" will limit the market shares that should be assigned to these carriers. As this transition occurs, the capacity of the cellular carriers will increase. For example, as described above, if a cellular operator must reserve 10 MHz of capacity for analog and the conversion from analog to digital increases the capacity of the converted bandwidth six-fold, the operator's share would be 10.9 percent, based on the current allocation to PCS/cellular of 170 MHz. As the cellular operator gradually converts more capacity to digital, its share will rise to a maximum of 14.7 percent. If, however, new capacity becomes available for mobile services during this period — through the use of SMR, for example — the cellular operator's share will not reach that level. For example, if an additional 10 MHz becomes available from

SMR carriers, a firm with 25 MHz of digital capacity will have a share of 13.9 percent, rather than 14.7 percent.⁵¹

Other new entrants into the provision of mobile telecommunications services may further serve to reduce concentration in the markets in which cellular operators compete.⁵² The Commission can be less concerned about increases in the capacity held by cellular operators as they shift to digital technology if, at the same time, the capacity share held by these operators is reduced by new entry. Indeed, even if, in the initial PCS auctions, limits are placed on the amount of spectrum in the 2 GHz band that can be licensed to cellular operators, it may be appropriate to relax these limits as new carriers enter to serve the mobile services market in the future.

Mobile Telecommunications Services Market Concentration

In the analyses above, we concluded that there is a market for all mobile telecommunications services, and that market shares associated with providing these services should be measured by the capacity of operators to deliver information through their assigned bandwidth. On the basis of market shares derived in this manner, we may evaluate concentration and the changes in concentration implied by the transfer of licenses covering specific amounts of bandwidth and capacity.⁵³

⁵¹While this may appear to be a relatively small decrease in share, the addition of 10 MHz of capacity would have a substantial effect on market concentration, as measured by the HHI. We discuss this issue below.

⁵²See S. Sugawara ("Battle in the Skies," *Washington Post*, "Washington Business," October 18, 1993, pp. 1, 14-15) for descriptions of a number of satellite-based wireless systems that are planned for deployment beginning in 1994.

⁵³In the text, we present calculations assuming that 10 MHz is reserved for analog applications, and that digital technology will have 6 times the effective capacity of analog. Our general conclusions are not affected by the specific number selected for either assumption, although their application to specific cases will be.

Initial Distribution of Bandwidth - Moderately Concentrated. Table 3 presents market share and concentration measures under the assumption that cellular operators do not secure any capacity in the forthcoming PCS auctions, and that all of the channels made available are licensed to different firms. [Tables 3 to 12 are appended to the text of this report.] Under these assumptions, existing cellular operators would have effective shares of 10.9 percent of mobile telecommunications capacity (ignoring SMR). A new PCS operator using Channel A or B would have a share of 19.6 percent.⁵⁴ The HHI for the industry would be 1342.⁵⁵ This is the least concentrated market structure possible in the period immediately after the PCS auctions.

Subject to certain limitations, current cellular operators will be allowed to acquire licenses for the use of 10 MHz of bandwidth in the PCS auction.⁵⁶ If just one of the cellular operators were to acquire a license for an additional 10 MHz, and all of the other firm shares presented in Table 3 remained unchanged, the cellular operator acquiring the added capacity would have a share of 17.4 percent, and the HHI would increase by 142, from 1342 to 1484. [See Table 4.]⁵⁷

Note that after the cellular operator acquires a license for an additional 10 MHz, to 35 MHz (17.4 percent of capacity), its share would remain below that of a new PCS competitor

⁵⁴During the period "analog handicap" is effective, cellular firms will have smaller shares than would occur without the handicap. Because the handicap limits industry capacity, each of the non-cellular firms has a larger share than would be the case without the handicap.

⁵⁵Because of rounding, there may be slight discrepancies between these HHIs and those obtained from the reported market shares.

⁵⁶Second Report and Order, ¶¶ 97-111.

⁵⁷The change in the HHI resulting from a single acquisition may be calculated by computing $2ab$, where a and b are the market shares of the merging firms. For the analysis in the text, the cellular operator and the acquired firm have shares of 10.9 percent and 6.5 percent, respectively. The change in the HHI resulting from the "merger" is $2(10.9 \times 6.5) = 142$. See Merger Guidelines, ¶ 1.51.

that acquired either Channel A or B, which conveys 30 MHz of bandwidth, and a 19.6 percent share. This "analog handicap" thus has a relatively large impact on the respective shares of the rival firms.

A cellular operator that acquired a license for 10 MHz of bandwidth could be permitted to acquire modest amounts of additional capacity without violating current antitrust agency enforcement standards. For example, if a cellular company acquired a license for another 5 MHz, the HHI would rise by only 92 points, from 1484 to 1576. Even if both of the cellular carriers had licenses to use 35 MHz, the addition of a license for 5 MHz by either firm (bringing its total to 40 MHz), would not trigger Guidelines review because the change in the HHI is less than 100 (in a moderately concentrated industry). [See Tables 5A and 5B.]

Initial Distribution of Bandwidth - Highly Concentrated. In light of the Commission's pending plan for the allocation of spectrum for PCS services, there is a very large number of possible distributions of licenses and consequent market shares. Evaluation of the change in concentration that would result from an acquisition that occurred after the initial assignments depends on which initial distribution eventuates. For some of these distributions, a specific transaction may have little if any competitive significance, while from other initial states the market share and concentration effects may be quite large.

The Commission's plan for assigning the PCS spectrum could result in relatively high initial levels of concentration. Some firms may hold licenses for up to 40 MHz (current cellular operators are limited to 35 MHz); 40 MHz devoted to digital technologies would yield a market share of about 26 percent of effective capacity. In Table 6 we present *pro forma* HHI calculations showing the "worst case," or most highly concentrated, market structure that could

occur under the Commission's plan. This market structure would have two non-cellular firms, each holding licenses for 40 MHz, the two cellular operators each with licenses for 35 MHz, and a fifth firm with a license for 20 MHz.⁵⁸ This distribution of firm sizes results in a market structure in which two new PCS suppliers have shares of about 26 percent, the incumbent cellular companies have shares of 17.4 percent each, and the HHI is 2136.

Under the Merger Guidelines, such a market would be considered highly concentrated. Even in such an industry, where there are only five firms, however, further acquisitions may be permitted, depending on the effect of the transactions on the HHI, as well as on other factors. Our analysis shows that many possible acquisitions by cellular operators of licenses for capacity beyond 35 MHz would not violate the Merger Guidelines. Indeed, many possible transfers of capacity would actually reduce market concentration. For example, Table 7 reproduces the most highly concentrated market structure possible, and evaluates the HHI implications of the acquisition of a license for 5 MHz by one of the cellular companies (increasing its assignment to 40 MHz) from the firm that initially held a license for 20 MHz. In this setting, the cellular firm would still have smaller share than the two new PCS competitors (20.7 percent versus 26.1 percent), and the HHI would rise by only 50 points. Under the Merger Guidelines, this transaction would only barely trigger an investigation, and might well be permitted after other market factors were considered.

⁵⁸It seems unlikely that such a concentrated structure would actually occur, at least at the time of the initial auction. For this structure to occur, each of the firm's acquiring Channels A and B (30 MHz in a MTA) must also acquire a 10 MHz channel in each of the BTAs within the MTA, and each cellular operator must acquire one of the 10 MHz allocations in each BTA within a MTA, which is also the same as its operating region. Any other initial distribution of the PCS spectrum would result in a lower HHI.

The contrast is more pronounced for another possible transfer. From the same initial distribution of capacity, assume that one of the cellular operators acquired a license for 5 MHz from a firm that initially held 40 MHz. In this case, the HHI actually falls by 35, from 2136 to 2101. [See Table 8.] The reduction in the HHI resulting from the decrease in the share of the selling firm is larger than the increase in the HHI that accompanies the cellular operator's acquisition of new capacity.

The End of the Analog Handicap and the Entry of New Competitors. At some point in the future, current cellular operators will be freed of the obligation to continue analog services. At that time, they will be able to offer all-digital services on comparable terms to the new entrants. The end of the analog handicap would tend to increase the shares of the cellular companies. Despite these increased shares for two of the larger firms, the HHI for the industry remains essentially unchanged. For example, in Table 9 we reproduce the shares and HHI from Table 3, and compare them to the HHI after the elimination of the analog handicap. The HHI changes from 1342 (With the Analog Handicap) to 1332 (without the analog handicap).⁹

Moreover, during the period in which the analog handicap will disappear, we also expect new firms to enter. As discussed above, we expect a significant amount of new capacity to be available from, for example, the consolidation and digitization of SMR carriers' capacity. If by the time the analog handicap is eliminated, two new firms, each having 5 MHz of capacity, were

⁹Although the shares and HHI contributions of the cellular firms increase, the shares and HHI contributions of each of the other, non-cellular firms declines because of the increase in industry capacity resulting from the elimination of the analog handicap.

to have entered, the HHIs would be lower than those presented above.⁶⁰ In Table 10, we have added firms each with 5 MHz of capacity to the distribution of firms in Table 9 (Without the Analog Handicap). The addition of these firms causes the HHI to fall from 1332 to 1204.

In more highly concentrated settings, the addition of 10 MHz of capacity, held by either one or two firms, has an even larger impact on the HHI. In Table 11A we assume that the analog handicap has ended, and one firm with 10 MHz of capacity has been added to the initial distribution of five firms shown in Table 6. In this setting, the HHI falls from 2093 (the HHI Without the Analog Handicap) to 1898. Beginning from this allocation with 40 MHz, an acquisition by one of the cellular firms of a license for 5 MHz from a firm with a license for 40 MHz would leave the HHI unchanged. If one of the cellular operators were to acquire a license for 5 MHz from the smallest firm, the HHI would increase by 93 points to 1991 [Table 11B]. Note, however, that even if this were to occur, the HHI would remain below the level that had prevailed prior to new entry when the analog handicap was present. [Compare Table 7.]⁶¹

The CTIA Proposal

In its Petition for Reconsideration, CTIA proposes a different assignment of bandwidth in the PCS auction than that specified in the Second Report and Order. Specifically, CTIA

⁶⁰We have assumed that only 10 MHz of capacity would be available for mobile services from the spectrum available to SMR operators. However, as much as 19 MHz may be available and could be consolidated. Thus, our assumption that only 10 MHz are included in the share calculations is conservative.

⁶¹Note also that, to the extent that the restriction on the cellular operators' right to acquire licenses for additional bandwidth is predicated on its "first mover" or incumbency advantage, by the time the analog handicap has been eliminated the new PCS firms likely will be established, viable competitors. If that occurs, there may no longer be any reason to limit or restrict the now-old cellular carriers. Indeed, such a limitation on the right to transfer ownership might unnecessarily lead to an inefficient allocation or use of the PCS spectrum. Thus, the rationale for placing limits on cellular operators may erode with time as new competitors become established.

proposes that the FCC award four 20 MHz and four 10 MHz licenses. This distribution of bandwidth would result in lower market concentration than the assignments currently contemplated. Table 12 presents share and HHI calculations for the spectrum assignment proposed by CTIA. The table includes calculations that both reflect and ignore the analog handicap, and assumes that: (1) incumbent cellular operators do not secure a new license; and (2) each license is acquired by an independent firm. Under these assumptions, the initial HHI with the analog handicap is 1087, and it is 1125 without the analog handicap. The HHIs resulting from the initial distribution anticipated by the FCC are presented in Table 9. In each case (with and without the analog handicap), the HHI falls by more than 200 points. With the analog handicap, the HHI falls from 1342 to 1087; without the analog handicap, the HHI falls from 1332 to 1125.

Computing Market Shares Within a Geographic Market

The computations presented above are "worst case" estimates of HHIs within a mobile telecommunications services market. The calculations assumed that each firm with a spectrum assignment served all customers within the geographic market. In fact, this will often not be the case. Because licenses may be awarded for both broad and narrow regions, and because price discrimination is barred by Section 202(a) of the Communications Act, many providers are likely to offer service to only a portion of customers within a broader market. For example, assume that a MTA is a relevant geographic market for mobile telecommunications services. Some firms will likely only serve one or more BTAs within the broader MTA-wide market. One firm will have an assignment of 20 MHz within some BTA, and (ignoring the analog handicap) a corresponding 11.8 percent bandwidth share in that BTA ($20 \text{ MHz} \div 170 \text{ MHz} =$

.118] If that licensee, however, operates only within that BTA, its ability to serve customers in the entire geographic market (which in this example is the MTA) is determined both by its bandwidth and by the proportion of the population (or potential customers) in that BTA. Thus, if a firm has an 11.8 percent share of the bandwidth in a BTA that contains 20 percent of the population within the overall MTA market, then its share of the market is only 2.4 percent — the portion of the population in the BTA multiplied by the share of capacity within the BTA [$.118 \times .2 = .024$ percent].

This issue of the proper computation of a firm's share within a geographic market bears directly on the Commission's proposed limitations on the right of cellular operators to secure MTA-wide licenses in the upcoming PCS auction. The Second Report and Order bars a cellular operator from securing a MTA-wide license for 30 MHz of bandwidth if that operator already serves more than 10 percent of the population within the MTA.

Assuming again that the MTA is a relevant geographic market, using the method described above, we may estimate the share that a cellular operator would hold if it were assigned a 30 MHz, MTA-wide license. The cellular operator's market share in the MTA would be composed of two parts, its share represented by the MTA-wide, 30 MHz license, and its share within the BTA(or BTAs) where it operates weighted by the proportion of MTA population in the narrower area (areas). Assume, for example, that the operator served, under its cellular license, only 10 percent of the population within a MTA, and that it then secured a 30 MHz allocation of spectrum in the PCS section. The first component of its share would simply be the share attributable to the 30 MHz that may be used to serve the entire MTA, or 17.6 percent [$30 \text{ MHz} \div 170 \text{ MHz} = .176$].

The second component of its market share, attributable to its cellular operation, depends on the portion of the population served within the MTA. Wherever such a firm currently operated, it would have assigned bandwidth of 25 MHz, or 14.7 percent of the bandwidth in that (limited) area [$25 \text{ MHz} \div 170 \text{ MHz} = .147$]. Its share of the capacity to serve customers within the broader market (the MTA) represented by this cellular license would be only 1.47 percent [$.147 \times .10 = .0147$], reflecting the fact that the firm serves only 10 percent of the population under that cellular license. The share of that firm within the total market is, thus, the sum of 17.6 percent (its MTA-wide share) and 1.47 percent (the share attributable to its cellular operation), for a total share of the market of about 19.1 percent. The cellular operator's share within the market increases as the portion of the population served with the cellular license rises. For example, if the cellular operator served 25 percent of the population in the MTA, and it was allowed to acquire the rights to a 30 MHz license, it would have a marketwide share of 21.3 percent.

The rule barring a cellular operator from acquiring the rights to a MTA-wide, 30 MHz license, if it currently serves 10 percent of the population, limits its market share within the MTA to no more than 17.6 percent. The Second Report and Order, however, allows new, non-cellular operators to acquire as much as 40 MHz, or 23.5 percent of the capacity within a MTA. Thus, the limit imposed on cellular companies results in a substantial difference between the positions that may be achieved by the two classes of competitors. As shown above, the share of the cellular operator would rise toward the 23.5 percent ceiling that is allowed for other firms as the proportion of the population served under the cellular license increases. The portion of the population within the MTA served under the cellular license would have to rise to just over

40 percent before its share of the capacity to serve customers within the market reached 23.5 percent.⁶²

These examples have assumed that: (1) a cellular firm's territory was the same as a BTA; (2) the cellular firm's operations are limited to the MTA, i.e., that its operations did not "spill out" of the MTA; and (3) the MTA is a relevant geographic market. However, the methodology presented above is also applicable if the MTA is a market and the cellular operator's territory is wholly within that market.⁶³ If the cellular company's territory extends beyond the MTA, and the relevant geographic market is broader than a MTA, then the methodology is overly conservative. Where the geographic market is larger than a MTA, and the cellular operator's territory extends outside the MTA (but remains within some broader market), the formula described above, by limiting attention to only a portion of the total market, will systematically overstate the share of the cellular operator. This implies that when the geographic market is larger than a MTA, a cellular company could serve even more than 40 percent of the population within the MTA, and still not attain a share of 23.5 percent.

VI. Limitations on Collusive Behavior

Under the Merger Guidelines, the number and size distribution of firms in a market are important initial indicators of the likelihood of competitive behavior. This follows from a belief

⁶²[Share from MTA Allocation] + [(BTA Share)(BTA Portion of Population)] = Total MTA-Wide Share. Assume that 1) the cellular operator acquires a 30 MHz MTA allocation (17.6 percent); 2) holds a 25 MHz allocation within some BTA (14.7 percent); and 3) may hold a share of no more than 23.5 percent of the MTA's capacity. One may solve the equation for the maximum proportion of the MTA's population that can be served by the cellular operator within its BTA. $.176 + .147(\text{BTA Portion of Population}) = .235$. BTA Portion of Population = .401.

⁶³If the Cellular Geographic Service Area (CGSA) is different from a BTA, but lies entirely within a MTA, BTA would be replaced by CGSA in the formula in footnote 62.

that market participants can more easily coordinate their behavior when they are few in number. Similarly, the costs of monitoring the behavior of others, and enforcing any collusive arrangement by punishing "cheaters," are lower when there are few industry participants.

The opening of the 2 GHz band for the provision of Personal Communications Services, and the developments in the SMR band described above, will contribute to a reduction in concentration in the provision of mobile telecommunications services. However, in this as in other markets, it is necessary to look beyond measured concentration in judging the extent of market competitiveness.

Many factors that are present in the mobile telecommunications market make concerns about anticompetitive behavior even less important than might be suggested by the number of firms and their respective market shares. These factors, which influence the strategies each firm pursues, and thus affect the extent of market competitiveness, are: (A) the rapid pace of technological progress in the industry; (B) the rapid growth in the demand for mobile services; (C) the wide array of service offerings; (D) the structure of costs; and (E) an expanding fringe.

Factors that make collusion more difficult and affect the ease with which deviations from a collusive outcome can be detected and punished help to determine how close to the competitive outcome the mobile telecommunications industry's performance will be.⁶⁴ As a result, they should be taken into account by the Commission when it considers whether to place limitations on the share of the mobile services market that can be served by any firm or firms.

Technological Progress. The rapid technological change in the provision of mobile telecommunications is manifested in a high degree of variability in the services offered and the

⁶⁴See G.J. Stigler, "A Theory of Oligopoly," Journal of Political Economy 74 (1964), pp. 44-61.

prices of those services. As new services are offered, a collusive agreement is difficult to maintain because the price of each new service must be integrated into the existing price structure.⁶⁵ When firms are continually modifying, improving, and adding new products and services, reaching agreement on a collusive price is itself problematic. Moreover, as providers adopt new technologies, the introduction of new service packages offers opportunities to "cheat" on any putative anticompetitive agreement without provoking the "punishment" that might otherwise occur, in part because it is difficult for rivals to determine the appropriate price for a new service. As a result, new services are likely to be offered at more competitive prices, because it is easier to deviate from a collusive agreement when products are changing.⁶⁶

In addition, rivals may perceive that the new services are being offered at prices that are "too low" because they do not know what those prices should be.⁶⁷ If technology and service offerings were stable, agreements might eventually be reached on appropriate pricing, but such agreements are difficult to effect when technology is changing continuously, as in the mobile telecommunications services market. "Misunderstandings," or the belief that a rival is cutting price in violation of a collusive agreement, will undermine an individual firm's confidence in the stability of an agreement, and may result in further price cuts.

⁶⁵R.A. Posner, Antitrust Law: An Economic Perspective (Chicago, IL: The University of Chicago Press, 1976), pp. 59-60.

⁶⁶F.M. Scherer and David Ross, op. cit., p. 285, observe that "the more rapidly producers' cost functions are altered through technical change and the more unevenly those changes are diffused throughout the industry, the more likely there will be conflict regarding pricing choices."

⁶⁷One factor that contributes to this difficulty is that firms may have different costs for new services, yet each firm is unable to gain information on the costs of its rivals. Thus, a low price might be treated as a deviation from an agreement when it only reflects the low costs of its supplier.

Market Growth. The rapid rate of technological innovation not only hinders the smooth functioning of a collusive pricing agreement in the mobile services market, but it also results in rapid market growth. Such growth may weaken the incentive for firms to participate in collusive agreements because, when markets are growing rapidly, demand may become more inelastic, so the gains from deviating from a collusive price are greater.⁶⁸ If the probability of detection is unchanged and the gains from deviation are increased, firms are more likely to price aggressively, to the benefit of consumers.

The mobile telecommunications services market, even when confined to mobile telephone service, has exhibited extraordinary growth during its relatively brief history. The number of cellular subscribers has increased from about 1 million in 1984 to more than 15 million in 1993. In these circumstances, there are potentially large gains to be made from attracting a large proportion of new subscribers.⁶⁹

The importance of this factor is further enhanced if there are significant learning economies. By keeping its prices low, a firm can increase production and achieve cost savings more rapidly as it moves down its learning curve.⁷⁰ Economic models that incorporate learning economies predict that industry performance will be better if, instead of a large number of very small firms, the industry consists of a few large, long-run, profit-maximizing firms. The predictions of such models are consistent with past developments in the mobile telecommunications industry.

⁶⁸J.J. Rotemberg and G. Saloner, "A Supergame-Theoretic Model of Price Wars During Booms," American Economic Review 76 (1986), pp. 390-407.

⁶⁹This may be offset to some degree by the relatively high rate of "churn" among subscribers.

⁷⁰A.M. Spence, "The Learning Curve and Competition," The Bell Journal of Economics 12 (1981), pp. 49-70.

Service Heterogeneity. A third characteristic of the mobile services market that weakens industry cohesion, and thus the ability of firms to raise prices, is the heterogeneity of product offerings.⁷¹ The absence of an obvious basis for comparing service prices increases the cost of monitoring and punishing deviations from any collusive agreement.⁷² With the introduction of PCS, product heterogeneity will increase. As a result, the cost of monitoring a collusive agreement also will increase because price changes that reflect differences in service quality will be difficult to distinguish from those that undercut a tacit agreement.

The Structure of Costs. An important factor that affects the ability of firms to coordinate their pricing decisions is the structure of their costs. In particular, collusive behavior is generally believed to be less likely in industries, like mobile telecommunications service, where a significant portion of a firm's costs must be incurred regardless of the level of its output, i.e., when fixed costs are high relative to variable costs. In such circumstances, the incentive of a firm to reduce prices if demand falls short of capacity is much greater than it is in situations in which output reductions result in larger reductions in costs. As Scherer and Ross note:

There is reason to believe that industries characterized by high overhead costs are particularly susceptible to pricing discipline breakdowns when a cyclical or secular decline in demand forces member firms to operate well below designed plant capacity.⁷³

⁷¹This is distinct from the rapidity with which service offerings change, which was discussed above. Both factors are present here.

⁷²K.W. Clarkson, and R.L. Miller, Industrial Organization: Theory, Evidence, and Public Policy (New York, NY: McGraw-Hill Book Company, 1982), pp. 335-336.

⁷³Op. cit., p. 286.

They go on to observe that:

When demand falls below levels that will sustain capacity output, the profit-maximizing enterprise with high fixed costs cuts prices more sharply and suffers more severe erosion of profits than a similarly inclined firm with low fixed costs.⁷⁴

The reason for this difference in behavior is that a firm with large fixed costs and substantial excess capacity will experience significant losses because so few of its costs decline when its output falls. In turn, the firm has strong incentives to increase its output by cutting prices because the change in output can be accomplished at relatively little additional cost. In such situations, pricing discipline among firms is difficult to maintain.

Although the demand for mobile telecommunications services is expected to grow rapidly, it is also the case that much investment is both expected, and will have to be made, in anticipation of that demand growth. There are thus likely to be many situations or time periods in which some firms have substantial excess capacity, i.e., they will be able to increase their output while incurring relatively few additional costs. That is precisely the situation in which economic analysis indicates that vigorous price competition is most likely, and that collusion is unlikely.⁷⁵

An Expanding Fringe and Future Entry. The calculations we have carried out above show the importance of the expanding "fringe" in the mobile telecommunications services market. The increased ability of SMR operators to offer a wider variety of mobile telecommunications services argues for including them in the market, and the calculations reported above reveal how much the inclusion of two significant SMR providers reduces measured concentration. Some

⁷⁴Op. cit., p. 288.

⁷⁵Put differently, what drives competition in a high fixed cost-low variable cost industry is a discrepancy between capacity and demand, and that discrepancy can result either from a decline in demand or from rapidly growing capacity.

additional entry can probably be expected from this source, which would reduce concentration still further.

In addition, entry is likely from the large number of planned mobile satellite ventures, many of which will target the United States market.⁷⁶ The proposed entrants are supported by major telecommunications firms, including Motorola, Sprint, GTE, Comsat, Hughes, McCaw, and TRW. This forthcoming entry further reduces the significance of existing market shares as measures of the future competitiveness of the mobile services market.⁷⁷

In sum, there is a variety of important market conditions that inhibit the ability of firms offering mobile telecommunications services from either reaching or enforcing a collusive agreement. When such factors are present, even transactions that increase concentration beyond certain trigger levels, like those in the Merger Guidelines, will likely not threaten to reduce competition.

Efficiencies From Combining Cellular and PCS

While anticompetitive conduct from allowing incumbent cellular operators to acquire capacity in the 2 GHz band are unlikely, there are efficiency advantages from permitting them to do so. For example, an FCC Office of Plans and Policy Working Paper⁷⁸ finds that there are strong economies of scope between cellular services and PCS that result from the Operations, Administration, and Maintenance Services, Switching, and Handsets components of the cost

⁷⁶S. Sugawara, "Battle in the Skies" (Washington Post, "Washington Business," October 18, 1993, pp. 1 and 14-15) describes nine such systems.

⁷⁷¶ 1.521 of the Merger Guidelines recognizes the importance of changing market conditions. It notes that "recent or ongoing changes in the market may indicate that the current market share of a particular firm either understates or overstates the firm's future competitive significance."

⁷⁸D.P. Reed, op. cit.

model it analyzes. The results, which indicate that there are cost savings of about \$65 per subscriber per year from combining cellular and PCS operations (assuming a 10 percent penetration of PCS and a 25 MHz spectrum allocation), are similar to the economies of scope found from combining cellular with either telephone or cable television operations.

VII. Policy Implications

On the basis of the analyses above, we reach several specific conclusions. First, the limitation on the amount of bandwidth that may be licensed to a cellular operator could reasonably be relaxed in many areas without the risk of anticompetitive harm. Even if BTAs were meaningful geographic markets, we do not believe that allowing cellular operators to acquire and hold more than 35 MHz of bandwidth would necessarily harm competition. In many market settings, such acquisitions would not even trigger significant investigation under the Merger Guidelines. Second, because the geographic market for mobile telecommunications services will often be broader than a BTA, limiting the ability of a cellular carrier to bid for licenses for 10 MHz of capacity in areas where it already serves only 10 percent of the populations may, on competition grounds, be too restrictive.

The 35 MHz Limit

Given our analysis of shares and concentration in the market for mobile telecommunications services, even on purely structural grounds, allowing the cellular companies to acquire some additional bandwidth (5 MHz, for example) beyond the amount they are permitted to acquire in the PCS auctions would not necessarily trigger serious antitrust review. Beginning from a market structure for mobile services that is moderately concentrated, one can